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EUROPEAN PARTNERSHIP

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MetNH3Energy

Metrology to Support Ammonia Use in Emerging Applications

Objectives

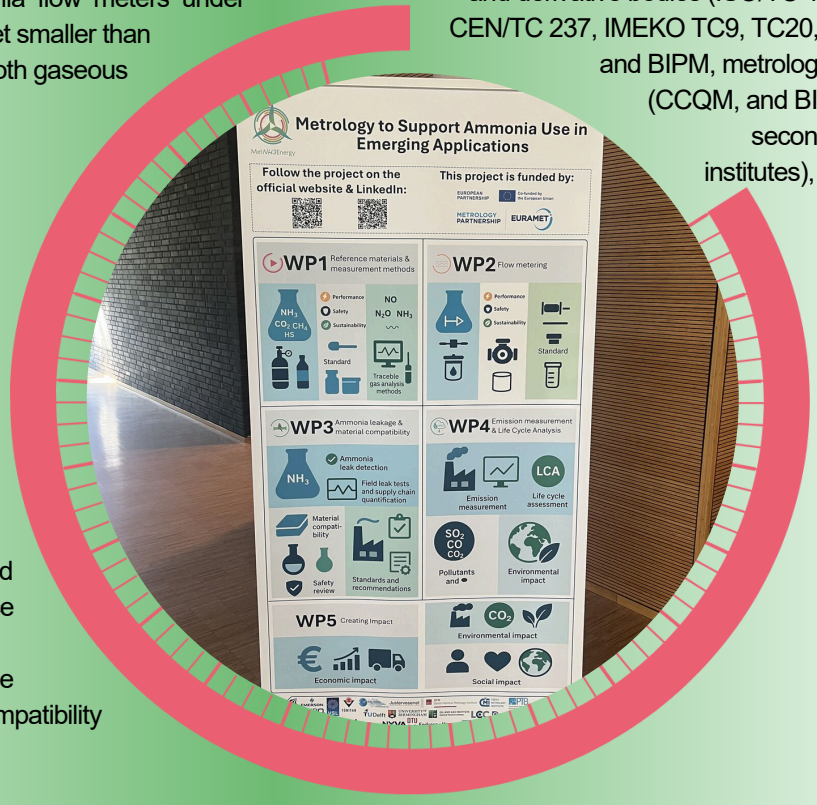
1. To develop new primary reference materials and gas analysis methods for ammonia as an energy carrier. This will include analysing different groups of impurities (e.g., H_2O, CO_2, CH_4, H_2S) arising from various production process value chains. Furthermore, to develop static and dynamic gas reference materials for priority air pollutants (e.g., NH_3, N_2O) from hydrogen production processes for leakage measurement and emission monitoring during thermo-chemical ammonia conversion processes.

2. To develop calibration and validation procedures for flow meters used for gas and liquid ammonia flow measurement, and custody transfer under field conditions. In addition to investigate the use of surrogate fluids (e.g., water, air, nitrogen) and optical methods (e.g., laser-Doppler-velocimetry) for calibration of ammonia flow meters under laboratory conditions (uncertainty target smaller than 0.3 %) and under field conditions for both gaseous and liquid ammonia.

3. To develop traceable monitoring methods for accurately quantifying ammonia leaks in its value chain and to establish a metrology infrastructure to support ammonia leak detection by developing capabilities to create SI traceable and controlled releases that mimic leaks. In addition, to determine the material compatibility of sensors and instruments (e.g., temperature, pressure, flow) in an ammonia-enriched environment by evaluating performance degradation, ageing, and adsorption/desorption effects. These studies will be extended to evaluate the material's compatibility for long-term storage of ammonia.

4. To develop traceable and validated real-time online stack emission (e.g., NH_3, N_2O, NO, NO_2) and flow monitoring measurements (including uncertainty estimations) with an evaluation of the effects of ammonia impurities on pollutant formation (e.g., SOx, CO, CO_2) during the thermo-chemical conversion of ammonia. In addition, to conduct an attributional LCA for ammonia for a set of specific applications (e.g. as a fuel), by providing estimates for 17 mid-point environmental categories and associated key uncertainty (e.g., pollutants, GHG emissions, eco-toxicity).

5. To facilitate the early uptake of novel calibration services, reference materials and methods, best practices, and results by end-users (i.e., H_2 users, shipping and power generation sectors, sensor manufacturers, policymakers), standardisation and derivative bodies (ISO/TC 158, ISO/TC 30, CEN/TC 237, IMEKO TC9, TC20, TC24, CCQM, and BIPM, metrology organisations (CCQM, and BIPM, NMIs, DIs, secondary calibration institutes), and academia.



About MetNH$_3$Energy

Ammonia is an attractive alternative to enable hydrogen transportation as it is a non-explosive gas that becomes liquid at higher temperatures than H_2. Nevertheless, there are many critical gaps in the present infrastructure. Impurities might be produced as ammonia is cracked to generate H_2, degrading hydrogen fuel or causing leaks into the atmosphere.

This project will address the abovementioned issues, providing new reference materials for priority pollutants and determining traceable monitoring methods for accurately quantifying ammonia leaks. It will develop traceable, real-time emission monitoring techniques to understand the effect of impurities on pollutant formation. It will also assess the performance of sensors in harsh ammonia environments and investigate the use of alternative fluids and optical methods for calibrating ammonia gas and liquid flow meters.

This work will support the entire hydrogen chain by enhancing ammonia trade, improving emission monitoring and leak detection, benefiting both businesses and supporting the EU's sustainability goal.

Project Partners